

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:)	
)	
Inventors: Krishnan et al.)	
)	
Serial No.: 10/773,629)	ATTORNEY FILE NO.
)	040250
Filed: February 5, 2004)	
)	Customer No.: 23,696
Title: POWER CONTROL IN)	
AD-HOC WIRELESS)	Examiner: John J. Lee
NETWORKS)	
)	Confirmation No.: 8348
)	
)	Art Unit: 2618

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

This is an appeal from the rejection by Examiner John J. Lee, Group Art Unit 2618, of claims 1-22 as set forth in the CLAIMS APPENDIX, all claims in the application.

REAL PARTY IN INTEREST

The real party in interest is Qualcomm Incorporated, as assignee of the present application by an Assignment in the United States Patent Office, with a recordation date of February 5, 2004 at Reel 014974, Frame 0141.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF THE CLAIMS

Claims 1-22 are in the application.

Claims 1-22 are rejected.

Claims 1-22 are appealed.

STATUS OF AMENDMENTS

New claims were added in an amendment mailed to the PTO on May 17, 2006. This amendment has been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

The problem addressed by the claimed invention is associated with setting optimum transmission power levels in an ad-hoc network, as presented in the specification in [0004, 0008, and 0051]. Ad-hoc networks such as Ultra-Wideband (UWB) networks transmit signals that are spread across a wide frequency bandwidth, which advantageously appear as low power noise. However, if several ad-hoc terminals are operating in close proximity, the cumulative effect of the wide-band transmissions is to raise the “noise” floor, creating interference. But, to

simply raise the transmit power level in one communication link between two particular terminals, adds interference to all the other communication links in the network.

Generally, the Applicant's solution to the above-mentioned problem is to use a closed-loop power control system, which uses feedback communications from a receiving terminal to adjust the power level of the transmitting terminal [0054]. This solution is more effective in the presence of wide-band interference, than for narrowband interference. In one aspect, the claimed invention determines if the interference is wide-band before the closed-loop power control system is enabled.

More explicitly, claim 1 recites a method for power control, as shown in Fig. 6. Step 802 determines if there is an interferer and Step 806 determines if a detected interferer is narrowband. The combination of the two steps describes the claim limitation of determining if a wide-band interferer is above or below a threshold [0050-0051]. Step 804 disables the closed-loop power control if there is interference, which describes the claim limitation of disabling closed-loop power control if wide-band interference is below the threshold [0050-0051]. Step 810 enables closed-loop power control if no narrowband interference is detected in Step 806, which describes the claim limitation of enabling closed-loop power control in response to determining wide-band interference above the threshold [0051]. A power feedback signal indicating a power transmission level is sent if the closed-loop power control is enabled [0054].

Claim 8 recites a wireless terminal, as shown in Fig. 5. Generally, a receiving terminal 302 performs the power control operations of Fig. 6, as described above in the explanation of claim 1 [0048]. A

receiver 402 is able to make analog power measurements and determine a carrier-to-interference (C/I) ratio [0053 and 0056], and can be understood to be an example of a means for determining wide-band interference above or below a threshold. A baseband processor is coupled to receiver 402, so that received signals can be processed [0038]. The baseband processor includes a scheduler 406, which may be used to select transmission power levels [0041], and a controller 418 that provides power level information to a computational module 408 [0045]. The computational module is able to calculate path loss. Thus, the baseband processor may be considered as an example of a means to enable or disable closed-loop power control in response to wide-band interference determinations. A transmitter 404 is coupled to the baseband processor, and may be considered to be an example of a means to send a power feedback signal indicating a power transmission level if the closed-loop power control is enabled [0053-0054].

Claim 12 recites a wireless terminal, as shown in Fig. 5.

Generally, a receiving terminal 302 performs the power control operations of Fig. 6, as described above in the explanation of claim 1 [0048]. A receiver 402 is able to make analog power measurements and determine a carrier-to-interference (C/I) ratio [0053 and 0056], and can thus be configured to determine wide-band interference above a threshold. A baseband processor is coupled to receiver 402, so that received signals can be processed [0038]. The baseband processor includes a scheduler 406 which may be used to select transmission power levels [0041], and a controller 418 that provides power level information to a computational module 408 [0045]. The computational module is able to calculate path loss. Thus, the baseband processor can be configured to enable closed-loop

power control in response to detecting wide-band interference. A transmitter 404 is coupled to the baseband processor to send a power feedback signal indicating a power transmission level if the closed-loop power control is enabled [0053-0054].

Claim 16 recites a computer readable medium embodying a program of instructions executable by a computer program. The claimed invention methods may be enabled as software and executed by a processor, and the software may reside in a computer readable media such as RAM, ROM, or EPROM, to name a few examples [0062]. As noted above in the description of Fig. 6, Step 810 enables closed-loop power control if no narrowband interference is detected in Step 806. Thus, the program code includes a means for enabling closed-loop power control in response to determining wide-band interference above a threshold. Step 804 disables the closed-loop power control if there is interference, which describes the claim limitation of a computer program means for disabling closed-loop power control if wide-band interference is below the threshold [0050-0051]. A power feedback signal indicating a power transmission level is sent if the closed-loop power control is enabled [0054], which describes the claim limitation of a program code means for sending a power feedback signal indicating a power transmission level if the closed-loop power control is enabled.

Claim 20 recites a power control method that is also described by Fig. 6. Step 802 detects an interferer [0050]. If an interferer is detected, Step 806 determines if the interferer is a narrow-band or

wide-band interferer [0051]. Step 810 enables closed-loop power control if a wide-band interferer is determined [0051].

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1-19 are unpatentable under 35 U.S.C. 103(a) with respect to Suzuki (US 6,788,138) in view of Hayashi (US 6,697,634).

2. Whether claims 20-22 are unpatentable under 35 U.S.C. 103(a) with respect to Suzuki in view of Nicholls et al. ("Nicholls"; US 2004/0062216).

ARGUMENT

1. The rejection of claims 1-19 as unpatentable under U.S.C. 103(a) with respect to Suzuki (US 6,788,138) in view of Hayashi (US 6,697,634).

In Section 2 of the Office Action claims 1-19 have been rejected under 35 U.S.C. 103(a) as allegedly unpatentable with respect to Suzuki in view of Hayashi. With respect to independent claims 1, 8, 12, and 17, the Office Action acknowledges that Suzuki fails to disclose the limitation of determining a wide-band interferer. The Office Action states, however, that Hayashi discloses such a limitation, and that it would have been obvious for one of skill at the time of the invention to modify Suzuki in light of Hayashi, with the motivation being to enhance a transmission power control technique for reducing the interference in a wireless CDMA system. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As

stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

At col. 2, ln. 25-51, Suzuki describes a transmitter with automatic gain control (AGC), see Fig. 1. The control section sets the control voltage level using negative feedback in a first control state. Alternately, open-loop power control is used in a second control state. The power of the transmitter is measured (Vdet) by a detecting circuit 3. Comparator 122 compares Vdet to a threshold voltage Vth. As a result of the comparison, the comparator generates either a high (H) or low (L) signal. If the output is H, switch 124 is turned on and switch 125 is turned off. In this state, Vdet is used as a negative feedback voltage to control the gain of amplifier 126. Otherwise, if the comparator generates L, the AGC is set to open-loop control, and the transmitter output power (Cpmd) is responsive only to the Vref input signal (col. 7, ln. 15 through col. 8, ln. 41). As shown in Fig. 4, the transmitter operates in the open-loop condition until the transmitter power reaches a threshold value.

Col. 1, ln. 15-62 of the Hayashi reference disclose a conventional CDMA transmitter power control (TPC) that uses both open-loop and closed-loop controls. Closed-loop control is based upon a SIR

quality measurement. Transmitter power is either increased or decreased in response to the quality measurement. Open-loop control subtracts the reception level of a known transmission level and a calculated path loss. In Fig. 4, Hayashi discloses details of an open-loop transmit power control (OL-TPC) section 161 and a closed-loop TPC (CL-TPC) section 162. The CL-TPC section 162 either increments or decrements the previous transmit power value in response to a TPC command from decoding section 134. Hayashi's OL-TPC and CL-TPC sections appear to be conventional. The novelty in Hayashi's disclosure appears to be in the calculation of a compensation value (col. 3, ln. 17 through col. 4, ln. 41).

The Suzuki and Hayashi references have been combined based upon the assumption that the combination discloses all the elements of independent claims 1, 8, 12, and 16. The claimed invention recites system and methods for enabling closed loop power control in response to determining wide-band interference above a threshold. The Office Action acknowledges that Suzuki does not determine wide-band interference. Further, Hayashi is absolutely silent on the subject of interference, and the enablement of closed-loop controls in response to detecting wide-band interference.

The claimed invention also recites the limitation of sending a power feedback signal if closed-loop power control is enabled. Hayashi is absolutely silent on the subject of sending a power feedback signal. With regard to Suzuki, the Office Action appears to be confusing a transmitter circuit negative feedback voltage (V_{det}) with the Applicant's power feedback signal. The Applicant respectfully submits that the power feedback signal recited in claims 1, 8, 12, and 17 can be distinguished from a negative feedback voltage. However, in the event of any

uncertainty in terms, the current consensus of the CAFC is that the claims be interpreted in light of the specification, see *Phillips v AWH Corporation*, No. 03-1269 (7/12/2004). The Court stated:

“Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. This court explained that point well in *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998):

It is the person of ordinary skill in the field of the invention through whose eyes the claims are construed. Such person is deemed to read the words used in the patent documents with an understanding of their meaning in the field, and to have knowledge of any special meaning and usage in the field. The inventor's words that are used to describe the invention—the inventor's lexicography—must be understood and interpreted by the court as they would be understood and interpreted by a person in that field of technology. Thus the court starts the decisionmaking process by reviewing the same resources as would that person, viz., the patent specification and the prosecution history.”

The Applicant has narrowly recited their invention in the context of a power feedback signal for indicating a power transmission level if closed-loop power control is enabled, as described in [0054] of the specification. Clearly, the Applicant's signal can be distinguished from Suzuki's feedback voltage. The Applicant respectfully submits that the Applicant's “power feedback signal” be given the definition that would be understood by a person of ordinary skill in the art, or in the alternative, the definition provided in the Applicant's specification.

With respect to the third *prima facie* requirement to support a case for obviousness, even if the Suzuki and Hayashi references are

combined, they do not explicitly disclose the limitations of enabling closed loop power control in response to determining wide-band interference above a threshold, or sending a power feedback signal if closed-loop power control is enabled, as recited in claims 1, 8, 12, and 16. Claims 2-7, dependent from claim 1, claims 9-11, dependent from claim 8, claims 13-15, dependent from claim 12, and claims 17-19, dependent from claim 16, enjoy the same distinctions.

With respect to the first *prima facie* requirement, the Office Action states that it would have been obvious to combine the prior art teachings to enhance a transmission power control technique for reducing the interference in a wireless CDMA system. However, even if this assertion were correct, it does not explain how an expert in the art could have modified either an AGC circuit or a conventional closed-loop control system to describe the all the elements of the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, the Suzuki and Hayashi references fail to disclose all of the claimed invention limitations. The above-quoted analysis from Office Action does not explain how even a person with skill in the art could modify a conventional closed-loop power control system, in recognition of the importance of determining if wide-band interference is present, since neither reference discloses the measurement of interference or a correlation between interference and closed-loop control. Alternately stated, the motivation to modify these references cannot be built upon a mere desire to “reduce interference”, as this analysis teaches nothing. Rather, to meet the first *prima facie* requirement, there must be an explicit teaching in the Hayashi reference that shows an expert how the Suzuki reference can be modified to yield the claimed invention. Such a

prima facie case has not been made, simply because all the Applicant's claim limitations cannot be found in the two references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki and Hayashi references, then additional evidence should have been provided in the Office Action. Notable, when the source or motivation is not from the prior art references, "the evidence" of motive will likely consist of an explanation or a well-known principle or problem-solving strategy to be applied". *DyStar*, 464 F.3d at 1366, 80 USPQ2d at 1649. The Examiner has not supplied any explanation of how an expert could possibly modify either of the references to incorporate the use of closed-loop control responsive to the measurement of interference.

Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Suzuki and Hayashi references as a foundation, no evidence has been provided to show that there is a reasonable expectation of success in the claimed invention.

In summary, the Applicant respectfully submits that a *prima facie* case has not been made to support the rejection of claims 1-19 as obvious.

2. *The rejection of claims 20-22 as unpatentable under U.S.C. 103(a) with respect to Suzuki in view of Nicholls et al. ("Nicholls"; US 2004/0062216).*

In Section 3 of the Office Action claims 20-22 have been rejected under 35 U.S.C. 103(a) as allegedly unpatentable with respect to Suzuki in view of Nicholls. With respect to independent claim 20, the Office Action acknowledges that Suzuki fails to disclose the limitation of

determining whether an interferer is narrowband or wide-band. The Office Action states, however, that Nicholls discloses such a limitation, and that it would have been obvious for one of skill at the time of the invention to modify Suzuki in light of Nicholls, with the motivation being “to enhance controlling and detecting power with interference by filtering for reducing the interference of received signal in a wireless CDMA system.” This rejection is traversed as follows.

Nicholls discloses a notch filter that detects and removes narrowband interferers in a wide-band CDMA radio frequency (RF) signal received on line 12. The RF signal is converted to an IF band signal and wide-band filtered (36), so that the wide-band power can be measured by detector 40. The RF signal is converted to an IF band signal and narrowband filtered (38), so that the power in a narrow portion of the band can be measured by power detector 42. Microcontroller 50 controls the frequency divider of phase-locked loop (PLL) 30 to sequentially measure the power in each narrowband segment. If a narrowband segment is detected with a high power level, it is assumed that a narrowband interferer exists. The microcontroller sets the frequency divider in PLL 18 accordingly, and the VCO offsets the RF bandpass using mixer 64, driving the RF band interferer into a notch filter 62, where it is attenuated. The offset in the RF bandpass is reversed in passing through mixer 68 [0014-0020 and 0027-0031]. The Applicant notes that Nicholls fails to disclose the identification or analysis of wide-band interferers, or a means of differentiating between wide-band and narrowband interferers. As noted above, Nicholls deliberately measures narrowband portions of the overall bandpass, and assumes that the largest detected IF signal must necessarily be narrowband. In fact, the Applicant respectfully

submits that Nichols is unable to determine the bandwidth of an interferer, or differentiate between narrowband and wide-band interferers.

With respect to the third *prima facie* requirement, even if the Suzuki and Nicholls are combined, they do not explicitly disclose the limitations of determining whether an interferer is narrowband or wide-band, as recited in claim 20. As noted above, Suzuki discloses a transmitter AGC. Nichols discloses a filter that tracks and attenuates narrowband interferers in a wide-band CDMA signal. Neither reference discloses any means of determining if an interferer is wide-band, or any means of comparing a narrowband interferer to a wide-band interferer. Further, neither reference discloses the limitation of enabling a closed-loop power control if a wide-band interferer is determined, as recited in claim 20. Again, neither reference can determine the existence of wide-band interference. Neither reference discloses the use closed-loop power control, or closed-loop power control response to interference analysis. Claims 21 and 22, dependent from claim 20, enjoy the same distinctions.

With respect to the first *prima facie* requirement, the Office Action states that it would have been obvious to combine the prior art teachings “to enhance controlling and detecting power with interference by filtering for reducing the interference of received signal in a wireless CDMA system.” However, this assertion does not explain how an expert in the art could have modified either an AGC circuit or an adaptive notch filter to describe the all the elements of the claimed invention. As explained above in response to the third *prima facie* requirement, even when combined, the Suzuki and Nicholls references fail to disclose all of the claimed invention limitations. The above-quoted analysis from Office

Action does not explain how even a person with skill in the art could modify an AGC circuit or notch filter, into an ad hoc network terminal that enables closed-loop power control in response to detecting wide-band interferers. The Office Action analysis is especially lacking since neither reference discloses ad-hoc network terminals or a correlation between wide-band interference and closed-loop control. Alternately stated, the motivation to modify these references cannot be built upon a mere desire to reduce interference. Rather, to meet the first *prima facie* requirement, there must be an explicit teaching in the Nicholls reference that shows an expert how the Suzuki reference can be modified to yield the claimed invention. Such a *prima facie* case has not been made because all the Applicant's claim limitations cannot be found in the two references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Suzuki and Nichols references, then additional evidence should have been provided in the Office Action. The Examiner has not supplied any explanation of how an expert could possibly modify either of the references to incorporate the use of closed-loop control responsive to the measurement of wide-band interference.

Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Suzuki and Nicholls references as a foundation, no evidence has been provided to show that there is a reasonable expectation of success in the claimed invention.

In summary, the Applicant respectfully submits that a *prima facie* case has not been made to support the rejection of claims 20-22 as obvious.

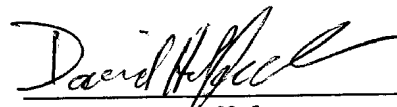
SUMMARY AND CONCLUSION

It is submitted that for the reasons pointed out above, the claims in the present application clearly and patentably distinguish over the cited references. Accordingly, the Examiner should be reversed and ordered to pass the case to issue.

The fee for this Appeal Brief has already been paid.
Authorization is given to charge any deficit or credit any excess to Deposit Account No. 17-0026.

Respectfully submitted,

Date: April 23, 2007



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CLAIMS APPENDIX

1. (Previously Presented) A method of power control, comprising:
 - determining whether a wide-band interference is above or below a threshold;
 - enabling closed-loop power control in response to determining a wide-band interference above a threshold;
 - disabling closed-loop power control in response to determining the wide-band interference is below the threshold; and
 - sending a power feedback signal indicating a power transmission level if the closed-loop power control is enabled.
2. (Previously Presented) The method of claim 1 further comprising:
 - disabling open-loop power control in response to determining a wide-band interference above the threshold; and
 - enabling open-loop power control in response to determining the wide-band interference is below the threshold.
3. (Original) The method of claim 1, wherein the power feedback signal is a power-up command indicating an increase in power transmission level.
4. (Original) The method of claim 1, wherein the power feedback signal is a power-down command indicating a decrease in power transmission level.
5. (Original) The method of claim 3, wherein the power feedback signal is a power-up command if a quality parameter is less than a target quality parameter.
6. (Original) The method of claim 4, wherein the power feedback signal is a power-down command if a quality parameter is greater than a target quality parameter.

7. (Original) The method of claim 1, further comprising sending a feedback signal indicating wide-band interference.

8. (Previously Presented) A wireless terminal, comprising:
means for enabling closed-loop power control in response to determining a wide-band interference above a threshold;
means for disabling closed-loop power control in response to determining the wide-band interference is below the threshold; and
means for sending a power feedback signal indicating a power transmission level if the closed-loop power control is established.

9. (Previously Presented) The wireless terminal of claim 8 further comprising:

means for disabling open-loop power control in response to determining a wide-band interference above the threshold; and

means for enabling open-loop power control in response to determining the wide-band interference is below the threshold.

10. (Original) The wireless terminal of claim 8, wherein the power feedback signal is a power-up command if a quality parameter is less than a target quality parameter.

11. (Original) The wireless terminal of claim 8, wherein the power feedback signal is a power-down command if a quality parameter is greater than a target quality parameter.

12. (Previously Presented) A wireless terminal, comprising:
a receiver configured to determine a wide-band interference above a threshold;
a baseband processor configured to enable closed-loop power control in response to detecting the wide-band interference, the baseband processor coupled to the receiver;

a transmitter configured to send a power feedback signal indicating a power transmission level if the closed-loop power control is enabled, the transmitter coupled to the baseband processor.

13. (Previously Presented) The wireless terminal of claim 12 wherein:
the baseband processor is configured to disable open-loop power control in response to detecting the wide-band interference above a threshold; and
the baseband processor is configured to enable open-loop power control in response to determining the wide-band interference is below the threshold.

14. (Original) The wireless terminal of claim 12, wherein the power feedback signal is a power-up command if a quality parameter is less than a target quality parameter.

15. (Original) The wireless terminal of claim 12, wherein the power feedback signal is a power-down command if a quality parameter is greater than a target quality parameter.

16. (Previously Presented) Computer readable media embodying a program of instructions executable by a computer program, said computer readable media comprising:

a computer readable program code means for enabling closed-loop power control in response to determining a wide-band interference above the threshold;

a computer readable program code means for disabling closed-loop power control in response to determining the wide-band interference is below the threshold;
and

a computer readable program code means for sending a power feedback signal indicating a power transmission level if the closed-loop power control is established.

17. (Previously Presented) The computer readable media of claim 16 further comprising:

a computer readable program code means for disabling open-loop power control in response to determining a wide-band interference above the threshold; and

a computer readable program code means for enabling open-loop power control in response to determining the wide-band interference is below the threshold.

18. (Original) The computer readable media of claim 16, wherein the power feedback signal is a power-up command if a quality parameter is less than a target quality parameter.

19. (Original) The computer readable media of claim 16, wherein the power feedback signal is a power-down command if a quality parameter is greater than a target quality parameter.

20. (Previously Presented) A method of power control, comprising:
detecting an interferer;
determining whether an interferer is a narrow-band interferer or a wide-band interferer, if an interferer is detected; and
enabling close-loop power control if a wide-band interferer is determined.

21. (Previously Presented) The method of claim 20, further comprising:
filtering if a narrow-band interferer is determined.

22. (Previously Presented) The method of claim 20, further comprising:
disabling close-loop power control and enabling open-loop power control, if an interferer is not detected.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE